SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Civil Engineering
B.Tech. (Second Year, IIIrd Sem.) Major Examination (Odd) 2019-20)

Entry No:

Date: 09-12-2019

Total Number of Pages: [02]

Total Number of Questions: [07]

Course Title: Geotechnical Engineering-I
Course Code: CEL 2061

Time Allowed: 3.0 Hours

Max Marks: [50]

Instructions/Note
  i.   Attempt All Questions.
 ii.   Support your answer with neat freehand sketches/diagrams/ graph, wherever appropriate.
iii.   Assume an appropriate data / information, wherever necessary / missing

Qst.	Section - A	Marks	CO
Q1.	Choose the correct answer:		

	(a) At Shrinkage limit, the soil is:
	  i. Dry iii. Partially saturated
	  ii. Saturated iv. Submerged
		[01]	CO1

	(b) The soils which plot above the A-line in the plasticity chart are:
	  i. Clayey soils iii. Silty soils
	  ii. Sandy soils iv. Organic soils
		[01]	CO2

	(c) The behaviour of clay is governed by:
	  i. Mass energy iii. Both (i) & (ii)
	  ii. Surface energy iv. Neither (i) & (ii)
		[01]	CO2

	(d) The hydraulic gradient is equal to the ratio of:
	  i. Total head to total length iii. Slope of flow line
	  ii. Slope of equipotential line iv. Head loss to length of flow field
		[01]	CO2

	(e) When consolidation of a soil occurs, the degree of saturation:
	  i. Increases iii. Decreases
	  ii. Remain constant iv. May increase or decrease
		[01]	CO3

	(f) Coulomb's equation for shear strength can be represented as:
	  i. $c = s + \sigma \tan O$ iii. $c = s - \sigma \tan O$
	  ii. $s = \sigma + c \tan O$ iv. $s = c - \sigma \tan O$
		[01]	CO4

Q2.	(a) What is the effect of compaction on the engineering properties of soil?	[04]	CO3
	(b) Describe clearly one method of computing coefficient of consolidation, given by Oedometer test data.	[04]	CO3
	Section - B		
Q3.	(a) The soil profile at a building site consists of dense sand up to 4 m depth, normally loaded soft clay from 4 m to 6.5 m depth, and stiff impervious rock below 6.5 m depth. The sand has a unit weight of 20 kN/m^3. For the clay, unit weight is 18 kN/m3, compression index is 22% and initial void ratio is 1.30. Calculate the final settlement of the clay layer due to an increase of pressure of 30 kN/m^2. Also calculate the settlement when the water table rises to the ground.	[04]	CO1
	(b) The following data refers to a silty clay that was assumed to be saturated in the undisturbed condition. On the basis of the data given below, determine the liquidity index, sensitivity, and void ratio of the saturated soil. Classify the soil according to the Unified soil classification systems.	[04]	CO3

Assume G=2.7.

Properties of soil sample	Undisturbed	Remolded
Strength (kN/m^2)	244	144
Water content (%)	22	22
Liquid limit (%)	--	45
Plastic limit (%)	--	20
Shrinkage limit (%)	--	12
% passing no. 200 sieve	--	90

Q4.	Explain the principle of the direct shear test, with neat diagram. What are the advantages of this test? What are its limitations?	[06]	CO4
Q5.	A horizontal stratified soil deposit consists of three layers each uniform in itself. The permeability of these layers are: 8×10^{-1}cm/s, 52×10^{-1}cm/s, and 6×10^{-1}cm/s, and their thicknesses are 7 m, 3m and 10 m respectively. Find the effective average permeability of the deposit in the horizontal and vertical directions.	[06]	CO2
Q6.	A homogeneous earth dam has a top width of 6 m and a height of 42 metres with side slopes of 3 (horizontal) to 1 (vertical) and 4 (horizontal) to 1 (vertical) on the upstream side and downstream side respectively. The free board is 2 m. There is a horizontal filter at the base on the downstream side extending for a length of 60 m from the toe. The coefficient of permeability of the soil is 9×10^{-2} mm/s. With the help of flow net, find the quantity of seepage per day for 100 metre length of the dam.	[06]	CO2

When an undrained triaxial compression test was conducted on specimens of clayey silt, the following results were obtained:

Soil sample	1	2	3
Chamber pressure (kN/m^2)	80	150	210
Max deviator stress (kN/m^2)	175	240	300
Pore pressure at max deviator stress (kN/m^2)	45	50	60

Q7. [10] CO4

With the help of Mohr circle, determine the values of shear parameters considering (a) total stresses and (b) effective stresses.

Course Outcomes

Students will able to:

    CO1. Find the index and engineering properties of the soil.
    CO2. Determine properties & demonstrate interaction between water and soil.
    CO3. Analyze and compute principles of compaction and consolidation of soil.
    CO4. Evaluate the stresses in the soil mass.

CO	Questions Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	1(a), 3(a)	5	59
CO2	1(b), 1(c), 1(d), 5 & 6	15	59
CO3	1(e), 2(a), 2(b)& 3(b)	13	59
CO4	1(f), 4 & 7	17	59